

## WHAT IS CLAIMED IS:

- 1 1. A semiconductor device comprising:
  - 2 a semiconductor chip mounted on a mounting substrate;
  - 3 a first resin filling a gap between the semiconductor chip
  - 4 and the mounting substrate;
  - 5 a stiffener surrounding the semiconductor chip; and
  - 6 a second resin filling a space between the semiconductor
  - 7 chip and the stiffener in contact with the first resin, the first
  - 8 resin being different in a thermal expansion coefficient from
  - 9 the second resin.
- 1 2. The semiconductor device as claimed in claim 1, wherein a
  - 2 thermal expansion coefficient of the second resin is smaller
  - 3 than a thermal expansion coefficient of the first resin.
- 1 3. The semiconductor device as claimed in claim 2, wherein the
  - 2 stiffener is adhered to the mounting substrate with a resin the
  - 3 same as the second resin.
- 1 4. The semiconductor device as claimed in claim 1, wherein the
  - 2 first resin includes an underfill part filling the gap between
  - 3 the semiconductor chip and the mounting substrate, and a fillet
  - 4 part extended from a region of the semiconductor chip.
- 1 5. The semiconductor device as claimed in claim 1, wherein the
  - 2 stiffener is adhered to the mounting substrate with a first
  - 3 adhesive being larger in a thermal expansion coefficient than
  - 4 the second resin.

1 6. The semiconductor device as claimed in claim 4, wherein the  
2 second resin is in contact with inner walls of the stiffener,  
3 the fillet part, the mounting substrate and each of side faces  
4 of the semiconductor chip.

1 7. A semiconductor device comprising:  
2 a semiconductor chip mounted on a mounting substrate;  
3 a first resin filling a gap between the semiconductor chip  
4 and the mounting substrate;  
5 a stiffener surrounding the semiconductor chip;  
6 a second resin filling a space between the semiconductor  
7 chip and the stiffener in contact with the first resin, the first  
8 resin being different in a thermal expansion coefficient from  
9 the second resin; and  
10 a lid for covering the stiffener and the semiconductor  
11 chip, wherein the lid is bonded to the stiffener and a backside  
12 of the semiconductor chip with a second adhesive.

1 8. The semiconductor device as claimed in claim 7, wherein the  
2 second resin is in contact with an inner wall of the lid.

1 9. The semiconductor device as claimed in claim 1, wherein an  
2 elastic modulus of the second resin is larger than an elastic  
3 modulus of the first resin.

1 10. The semiconductor device as claimed in claim 2, wherein  
2 the stiffener has a plurality of concave portions facing the

3 mounting substrate.

1 11. The semiconductor device as claimed in claim 10, wherein  
2 a planer shape of the stiffener is rectangular; and the concave  
3 portion is formed on each corner of the stiffener.

1 12. The semiconductor device as claimed in claim 10, wherein  
2 each of concave portions is filled with a resin the same as the  
3 second resin.

1 13. The semiconductor device as claimed in claim 2, wherein  
2 the stiffener end surface facing the mounting substrate is  
3 convexo-concave, and a gap between the mounting substrate and  
4 concave portion of the stiffener end surface is filled with a  
5 first adhesive.

1 14. The semiconductor device as claimed in claim 2, wherein  
2 the stiffener end surface facing the mounting substrate is  
3 convexo-concave, and a gap between the mounting substrate and  
4 concave portion of the stiffener end surface is filled with a  
5 resin the same as the second resin.

1 15. The semiconductor device as claimed in claim 2, wherein  
2 the stiffener end surface facing the mounting substrate is  
3 convexo-concave, the mounting substrate includes a first metal  
4 layer in a region facing the stiffener, the stiffener includes  
5 a second metal layer on a surface of a convex portion, and the  
6 mounting substrate and the convex portion of the stiffener are

7 connected to each other by a low-melting alloy.

1 16. The semiconductor device as claimed in claim 1, wherein  
2 the stiffener is made of a material selected from the group  
3 consisting of Cu, SUS, Al, alumina, silicon, aluminum nitride,  
4 and resin.

1 17. The semiconductor device as claimed in claim 1, wherein  
2 each of the first resin and the second resin essentially contains  
3 a resin selected from a group consisting of epoxy, polyolefin,  
4 silicon, cyanate ester, polyimide, polynorbornene resins.

1 18. The semiconductor device as claimed in claim 1, wherein  
2 a gap member different from the first adhesive is partially  
3 arranged between the mounting substrate and the stiffener.

1 19. The semiconductor device as claimed in claim 18, wherein  
2 the gap member is made of a low-melting alloy.